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PLEASE NOTE

This report presents unevaluated information on Soviet Bloc International Geophysical Year activities selected from foreign-language publications as indicated in parentheses. It is published as an aid to United States Government research.

SOVIET BLOC INTERNATIONAL GEOPHYSICAL YEAR INFORMATION

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I. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Sedov's Remarks on Launching of US Atlas Satellite

Pravda of 21 December 1958 carried the report of an interview with Academician L. I. Sedov, Academy of Sciences USSR, in which the launching of the US Atlas satellite was discussed.

Sedov, after congratulating US scientists on their achievement, derided the claims of weight superiority made by some officials and newspapers for the US satellite over the Soviet sputniks.

Sedov compared the payloads of the three Soviet satellites with that of the US. That of Sputnik I was 83.6 kilograms; of Sputnik II, 508.3; and of Sputnik III, 1,327, said Sedov, whereas that of the Atlas is 67.5 kilograms.

"To create a sensation, the weight of the new US satellite was combined with the 4-ton weight of the carrier rocket which placed it in orbit. Specialists and laymen know that in launching the Soviet satellites, the carrier rockets also entered into orbit and existed for a long time. Besides, no distinction was made between Sputnik II's carrier rocket and the apparatus container as is the case now in the US. The payload of the US satellite is 1/57 the weight of the orbiting carrier rocket.

"The weight of a carrier rocket is no indication of the exploratory potentialities of the scientific apparatus container and of the payload the rocket can carry. That is why the weight of the carrier rockets for Soviet satellites was not published.

"If one takes the relation of the weight of the payload to the weight of the carrier rocket to be equal to 57, as is the case for the US satellite, it will be found that the weight of the last stage of the third Soviet satellite, which traveled around the Earth for 6 months, must be more than 75 tons, instead of the 4 given for the US satellite.

"Inasmuch as we are speaking about the weight of Soviet carrier rockets, I must tell you that although their weight, placed in orbit, was less than 75 tons, it was considerably more than 4 tons, and this applies not only to the third Soviet satellite but also to the first and second.

"I can report that the weight of the carrier rocket of the first Soviet artificial satellite which was placed in orbit and circled the Earth for 2 months was much more than 4 tons."

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Sedov also pointed out that the height of the orbit and the lifetime of a satellite are very important indications. He recalled that the perigee of Sputnik I was 226 kilometers and its lifetime 3 months, exceeding, he said, the perigee and expected lifetime of the US satellite. ("In Connection With the New US Artificial Earth Satellite;" Academician L. I. Sedov's interview with a Tass correspondent; Moscow, Pravda, 21 Dec 58, p 6)

Sputnik III Data on Micrometeors Revise Initial Soviet Report

As a result of the reduction of Sputnik III materials, the paper titled "Rocket and Satellite Investigation of Meteors," by I. N. Nazarova, which was delivered at the Fifth Meeting of CSAGI in Moscow, 30 July-9 August 1958, has been revised. The new "preliminary data" indicate that an average frequency of impacts of less than $0.1/m^2/sec$ was recorded and that a shower of less than 10^{-10} $gr/m^2/sec$ strikes a 1 m^2 surface.

The full text of the revised paper is presented here. The newly inserted information has been underlined for the sake of identification.

"For recording meteor particles by means of rockets and satellites in the USSR, we use equipment which permits not only the recording of the number of impacts but also the measuring of certain mechanical parameters of meteor particles. Schematically speaking, the notion of a measuring device consists of the following:

"From the viewpoint which interests us, each particle may be characterized by its impulse and its energy (either mass or velocity).

"The impulse of a meteor particle when it strikes the barrier causes the measuring device to measure nothing, because the particle is exploded on the surface of the pickup and the impulse of the material on the pickup thrown out during the explosion considerably exceeds the impulse of the particle itself.

"Measuring this 'reactive' momentum perceptible to the pickup, we obtain no impulse of the meteor particle, but apparently (with a certain scaling factor) its energy. A theoretical calculation made by K. P. Stanyukovich showed that for high velocities the momentum recorded by us was proportional to the energy of the striking particle. At present, theoretical investigations and laboratory experiments for determining this relation are being conducted. It is possible that the exponent of the velocity in the expression $\frac{mv^2}{2}$ may be less than 2.

"Measurement of impulses would naturally be accomplished by a ballistic pickup. Even though the collision time was negligible (of the order of 10^{-8} sec) it was expedient to select the natural frequency of the

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pickup at about 400 cycles. The construction of the pickup consists of the following: it is a massive plate suspended by a flat spring to which four piezoelectric elements made of ammonium phosphate are connected.

"Displacement of the plate under the influence of the impact of a meteor particle causes a deformation of the piezoelectric elements with the delivery of an electrical voltage in the form of short-period attenuating vibrations which are separated according to amplitude by an amplifier-converter which computes the number of impulses in each amplitude range.

"Our pickups measure the impulse acting on their surfaces in the range 0.1 gr/cm/sec to 1,000 gr/cm/sec. Dispersion of readings in relation to the place of striking of meteor particles does not exceed 10%.

"If one proceeds from the simplest theoretical law of the relation of the impulse received by the pickup to the energy of the meteor particle and the scaling factor of the impulse in energy, calculated by K. P. Stanyukovich, who assumed that the mean velocity of the meteor particle was equal to 40 km/sec, then the pickups employed can measure the energy of meteor particles with masses from 10^{-9} grand higher as long as the pickup holds out. The sensitivity of the system may be increased.

"Thus one of two values characterizing the mechanical properties of meteor particles can be successfully measured. It can be very important because erosion of the satellite surface also is connected with particle energies.

"For recording meteor particles on the bottom of the satellite, four pickups with a total area of 840 cm^2 are installed. All pickups are situated in one plane. To the extent the position of the satellite in space is known from data of magnetic devices and solar orientation sensing elements, the position of our pickups is also naturally determined in space.

"According to preliminary data an average frequency of impacts of less than 0.01 / sec on an 840 cm^2 impact-sensitive surface was recorded which corresponds to less than approximately $0.1/m^2/sec$.

"Proceeding from the threshold sensitivity of the system in the given experiment, which permits registration of impacts of meteor particles with masses of 10^{-9} grams at a mean velocity of 40 km/sec, we find that a shower of less than 10^{-10} $gr/m^2/sec$ strikes a 1 m^2 surface.

"A short-period sharp increase in the number of impacts was recorded together with such a density of meteor matter.

"During different times of flight a different frequency of impacts was recorded. This result cannot be attributed to a change in the number of meteor particles with altitude even though, during orbital flight of the satellite, its altitude changed greatly, and even though simultaneously its position in space changed, the satellite, rotating and precessing, in various parts of the orbit was located relative to the Earth, and the Earth at times partially screened the pickups from the striking of meteor particles. It is possible that the change in the number of impacts during the motion of the satellite can also be determined by the direction of the meteor shower. At the moment of sharp increase in count at altitudes of 1,700-1,880 km the pickups recorded an average frequency of impacts equal to approximately 7.5/sec which corresponds to 90 impacts per 1 m^2.

"At altitudes of 1,300-1,500 km and 500-600 km an average of 40 and 38 impacts/sec/m^2, respectively, were recorded.

"Thus the maximum spread consisted at altitudes of

1,700-1,880 km	of	90 ± 34
1,300-1,500 km	of	40 ± 18
500-600 km	of	38 ± 10

"Proceeding on the assumption that the impulse perceptible to the pickup during impact of a particle is proportional to its energy, then the meteor particles recorded have energies of the order of 10^4 ergs.

"On a rocket the piezoelectric pickups for recording meteor particles are mounted on its frame and its head section.

"Piezoelectric pickups mounted on rockets and on the satellite differ in design and sensitivity. The sensitivity of rocket pickups was less.

"During rocket ascents the impacts of meteor particles at altitudes from 150 to 300 km were reliably recorded.

"The frequency of impacts, on the average, was equal approximately to 2.8/sec when the sensitive surface of the pickups was 900 cm^2. Scaled to 1 m^2 area, this corresponds to 31 impacts/sec." ("Rocket and Satellite Investigation of Meteors," by I. N. Nazarova; paper delivered at fifth CSAGI meeting, Moscow, 30 July-9 August 1958, 4 pp)

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Sputnik Completes 3,000 Revolutions of the Earth

Sputnik III completed 3,000 revolutions of the Earth at 2350 hours Moscow time on 18 December 1958. Two hundred and eighteen days have passed since the satellite was placed in orbit. During this period it has traveled a total of 138 million kilometers. The satellites's orbital period has decreased from its initial value by 3.71 minutes and is now 102.24 minutes, and its apogee has diminished from 1,880 kilometers to 1,530 kilometers. The average daily change in the orbital period at present is about 1½ seconds.

The "Mayak" transmitter is still functioning normally, indicating the reliability of the solar batteries which are its main source of power. These batteries are considered by the Soviets as the first step on the road to solving the problem of electric power for interplanetary craft. ("3,000 Revolutions Around the Earth"; Moscow, Pravda, 19 Dec 58, p 4)

"Stationary" Satellites

A recent issue of the Soviet popular science magazine Nauka i Zhizn' (November 1958) carried an article on "stationary" satellites. A satellite which would appear to remain in the same place to an observer on Earth would have to fulfill two conditions. First of all, the artificial satellite's motion would have to be from west to east, that is, in the same direction the Earth rotates. Secondly, it would be necessary to launch it to such an altitude that its orbital time would be equal to one day.

The value of such satellites is obvious. Three of them, 120 degrees from each other, would make it possible to survey almost the entire surface of the Earth at one time. Their use as transit points for cosmic flights would be invaluable.

Such a satellite would have to have a circular orbit with a radius equal to 6.6 Earth radii or an altitude of 356,000 kilometers /sic/ above the Earth's surface, and a velocity of 3,050 meters per second. ("About Everything"; Moscow, Nauka i Zhizn', No 11, Nov 58, p 70)

II. UPPER ATMOSPHERE

Geminids Shower Observed by Soviet Astronomers

One of the most important problems connected with the development of astronautics is that of the quantity and energy of the so-called micrometeors. How great a danger are they to those who will engage in future space travel?

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Scientific investigations are conducted hourly using high altitude geophysical rockets and artificial earth satellites. Apparatus carried by Sputnik III is so sensitive that it recorded the impact of micrometeors with a diameter of a thousandth part of a millimeter and a weight of a billionth part of a gram. It is calculated that approximately one micrometeor impact per square meter of surface occurs every 100 seconds. This indicates that the danger of encountering meteor bodies by interplanetary rockets is not great. Particles which could pierce a rocket or satellite would be encountered only once during several years of flight.

Sharp increases in the number of impacts on a satellite are sometimes noted, however, indicating that they occur during the passage of the satellite through a meteor shower. Several such showers regularly intersect the Earth's orbit.

Recently the Earth passed through one of the most powerful of these meteor showers, the Geminids. This shower consists of relatively large meteor bodies moving with a speed of about 35 kilometers per second in relation to the Earth. Soviet astronomers studying this stream established that it has an extremely short orbital period. It differs from the orbit of all known comets, planets, and asteroids. The Geminid shower circles the Sun in one year and 10 months. One of the best known of the short period comets, Encke's, has a period of revolution around the Sun of 3 years and 4 months. The Earth intersected the orbit of the Geminid between 1 and 17 December. During the height of the shower, up to 60 meteors were observed in one hour. Despite the apparent intensity of the shower, a cube of cosmic space with a side of 100 kilometers contained only 16 meteor particles and the possibility of a meteor body colliding with an artificial satellite during this time was merely doubled. ("The Most Powerful Meteor Shower," by V. Lutskiy, Lecturer at the Moscow Planetarium; Moscow, Izvestiya, 20 Dec 58, p 4)

New Astronomical Observatory of Odessa State University

A number of new scientific research institutes were created in the Soviet Union in connection with the conduct of the IGY. Among these was the astrophysical observatory in Mayaki, Odessa Oblast', the suburban branch of the Atronomical Observatory of the Odessa State University. This observatory was designated as the leading institute for conducting investigations on the problem of meteor observations.

These are some of the events leading up to the creation of the new branch. A new instrument which made it possible to improve considerably the method of observing meteors and to determine the moment of the meteor's flight, according to the form of its photographed image, was invented by Ye. N. Kramer, Candidate of Physicomathematical Sciences, an associate of the Odessa Observatory. Two models of the instrument were built by the

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inventor in collaboration with N. O. Timchenko, a technician of the Odessa Observatory. The Commission on Comets and Meteors of the Astronomic Council of the Academy of Sciences USSR approved this instrument and decided to create a standard meteor patrol for its use at meteor points during the IGY. At the beginning of the IGY, four complete installations were built which are operating regularly in observatories in Odessa, Kiev, and Askhabad.

Previous to this, observers were obliged attentively to study the sky, visually noting the path of the meteors and the precise time of their flight. Ye. N. Kramer proposed the introduction of a third vane in the design of the obturator. This vane changed its position in relation to the two other vanes of the obturator, whereby its shifting occurred in proportion to time. Breaks in the meteor's image attain various forms, depending on the moment of its flight.

The Odessa Observatory selected the village of Mayaki, Belyayevskiy Rayon, near the mouth of the Dnestr River, to establish it meteor points. An affiliate of the observatory was created here. A laboratory building with an area of 320 square meteors, three telescope pavilions, a water tower for an artesian well, and a high-voltage line for operation of the instruments and the radar unit were built.

A meteor patrol is located in one of the pavilions, and in another, the multicamera astrograph, which was built in 1956-1957. Whereas the meteor patrol makes it possible to photograph the sky with stationary cameras and star images are obtained in the form of "arcs" of diurnal parallels, the astrograph gives an accurate picture of stars. Images of meteors on the photographic plates made by the astrograph make it possible to control and improve the results which the meteor patrols give. More than 4,000 photographs of the star sky were taken on this astrograph since June 1957. The cameras are placed fanwise so that they cover the greater part of the sky. The great resolving power of these cameras makes it possible to study even very weak variable stars.

A 200-millimeter refractor, recently made in a Leningrad plant, is housed in the third pavilion. This high-quality instrument was used in 1957 for fulfilling various astrophysical observations.

A special radar device for registering radio echos from meteors, also built by the staff of the Odessa Observatory, is located in the laboratory.

Corresponding stations, necessary for studying meteors, are located in Kryzhanovka and the Botanical Garden, where a small building was also erected.

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The study of variable stars being conducted in the new observatory has also made it possible to expand operations in the field of investigating the galaxies. ("Astronomical Observatory on the Dnestr," by Prof V. P. Tsesevich, Corresponding Member of the Academy of Sciences Ukrainian SSR; Moscow, Priroda, No 10, Oct 58, pp 86-87)

Lunar and Planetary Investigations at the Abastumani Observatory

The investigation of the physical properties of the planets, the Moon and the Earth's atmosphere is one of the most important tasks of modern astronomy. This problem embraces such questions as the structure of the surfaces of planets and the Moon, the temperature and the heat-conductivity of their surfaces, the physical and chemical composition of the atmosphere, etc.

Photometric, colorimetric, and polarimetric investigations furnish much valuable data on the cosmic bodies nearest the Earth, such as the Moon and the planets. The application of these methods is most effective in the southern observatories, where together with favorable atmospheric conditions, there also exists the advantageously high (over the horizon) location of the ecliptic, near which the planets move.

The polarized properties of formations on the lunar surface were studied in recent years at the Abastumani Astrophysical Observatory of the Academy of Sciences Georgian SSR by a method of precise electrophotometry.

As a result of this study, it has been established that different lunar formations polarize light differently, according to their morphological and physical properties. Light reflected from the lunar seas is polarized the most, while that reflected from the land masses and mountain regions is the least polarized. The bottoms of craters and the bright rays occupy an intermediate position. A comparison of the maximum degrees of polarization of certain lunar formations with their reflective capabilities or brightness factor indicates that on the whole, an inverse relationship (although not very strictly) of the value of the degree of polarization to the albedo exists.

This indicates that lunar objects differ from each other not only in regard to relief but also in regard to the composition of matter and "geological" structure. Thus, inasmuch as the varied nature of the reflected light must be due to the different degree of granulation of the matter of the lunar surface (crystallic, mirror-form matter gives greater polarization than granulated matter), and on the other hand, the younger the formation the less the granulation it should have, a much later origin for the lunar seas can be established in comparison with other formations.

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The unusual nature of the form of curves for changes in the degree of polarity depending on the phase angles and incidence and also on the azimuth angle for various lunar objects is of interest. These peculiarities for individual objects of the lunar surface are probably due to their individual physical properties.

A consideration of the relationship of the maximum and minimum degrees of the polarization of lunar objects to their sizes shows that with changes in the sizes of craters, the value of the maximum degree of polarization remains constant. Between the values of these maximums and the sizes of craters, a certain decrease in the maximum degree of polarization with an increase in the sizes of craters was observed. Insofar as an analysis of the polarization of reflected light allows one to judge the relative age of the reflecting surfaces, this decrease was found to be in agreement with the so-called morphological law of the relationship of the bottoms of lunar craters ("The smaller--the younger--the lower") which was established by the French scientists Loewy and Puiseux, and supported the hypotheses of the endogenous (volcanic) origin of the lunar surface.

A series of about 1,400 precise electropolarimetric measurements made in Abastuman from 1950 to 1953 are the basis for the described results.

Photometry of the Moon during lunar eclipses is of no small value. This problem is directly related to geophysics. Thus, in connection with the fact that some illumination of the Moon found inside the Earth's shadow (in particular near the edge of the umbra) is created by the Sun's rays refracted by the upper layer of the Earth's atmosphere, it is possible to estimate the content and distribution of ozone in the Earth's atmosphere according to the distribution of illumination on the darkened Moon. The first electro-photometric measurements for these purposes were conducted in the Abastumani observatory during the eclipse of 8 December 1946. This experience will make it possible to use lunar eclipses for solving this problem.

Visual, photographic and electropolarimetric observations of Mars were conducted in the Abastuman observatory during the opposition of 1956. The most interesting phenomenon noted was the gradual diminution, separation, and, finally, the disappearance of the South Polar Cap from 18 August to 10 September, and then its reappearance. Such a succession of phenomena supports the theory of the thawing of snow or frost because of a rise in temperature rather than the seeming disappearance of the cap due to atmospheric mists. On the other hand, the remarkable appearance on 23 August and the following days, of bright white spots in Mars' southern hemisphere indicating some form of precipitation was first discovered by the Khar'kov Observatory, and thereafter in Abastumani and other Soviet and world observatories. Besides, the described phenomena was probably caused by the action of both factors, thawing and the conversion of mists, especially since the other peculiarity of the 1956 opposition was the extreme dustiness of the planet's atmosphere which prevented detailed investigation of the different regions of its surface by astronomers.

Electropolarimetric measurements revealed that the degree of polarization of light reflected from different surface formations on Mars did not exceed 0.5 percent. It was pointed out however, that presence of a yellow mist of low transparency was capable of sharply lowering the degree of polarization of the sunlight reflected from the surface.

An original instrument, a self-recording electropolarimeter, recently assembled in the Abastumani observatory, was successfully employed in the focus of a 40-centimeter refractor for making systematic measurements in different sections of the lunar surface. The electropolarimeter will be used during observations of Mars at the time of its opposition this year. It will also be used for studying the polarization properties of Jupiter and its satellites.

The study of the physics of the upper layers of the Earth's atmosphere has great scientific theoretical and practical value. One of the most effective methods of studying the upper atmosphere is the investigation of sky illumination at twilight and at night.

Brightness of the twilight sky is principally determined by the scattering of the Sun's rays, whereupon the coefficient of scattering is proportional to the density of the air. The principal theory of the twilight method of studying the Earth's atmosphere was developed by Academician V. G. Fesenkov. Another method for studying the twilight sky is connected with the possibility of detecting, by means of spectral investigations, the luminescence of isolated regions of the atmosphere settling in the lowest layers in the shadow of the Earth.

Investigations in both of these directions have been systematically conducted in the Abastumani Observatory since 1942 in the visible and infrared regions of the spectrum by the electrophotometric method. The total number of measured twilight curves consists of more than 1,500 (of these curves, about 800 are reduced to 18 different parts of the spectrum in the range from $\lambda = 3,790$ Å to λ; 9,400 Å). Systematic data was obtained on the structure of the atmosphere (vertical distribution of pressure and density). Comparisons of the data of zenith measurements with rocket measurements show a satisfactory agreement up to altitudes of 70-80 kilometers and a marked deviation for altitudes of more than 80 kilometers. This can be explained by the influence of repeated scattering of light. Recently, reliable data on the structure of the atmosphere was successfully obtained which is free, on the whole, from the effect of

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repeated scattering of light up to altitudes of 120 to 130 kilometers. This is due to the use of Fesenkov's method of making simultaneous measurements of the brightness of the sky at two points located in the vertical of the Sun at a zenith distance of 70 degrees to the east and west.

Detailed investigation of the spectral characteristics of the twilight sky revealed regular variations of the color index of twilights in relation to the zenith distance of the Sun and the seasons of the year. A correlation between the spectral characteristics of isolated layers of the atmosphere in its upper part, on the one hand, and solar activity, and also with the characteristics of the ionosphere (critical frequencies), on the other, was observed. Indications of the presence of luminescence in regions of the spectrum around λ = 9,400 Å observed in two comparatively thin layers at about 30-40 and 90-100 kilometers were obtained, whereas on separate days luminescence was absent.

Electrophotometric observations of night sky illumination have been conducted in the Abastumani observatory since 1952 mainly in the infrared region of the spectrum. The accumulated material made it possible to explain the seasonal variation of the intensity of brightness in four parts of the spectrum (from λ = 5,300 Å to λ = 9,600 Å), to arrive at the study of the connection of the intensity of brightness with solar activity, to establish the regularity of variations of brightness in relation to the activity of the Sun and the distribution of energy in the spectrum of the illumination at night. Spatial variations, that is, changes in the distribution of the intensity of infrared illumination according to the firmament at night were observed. Thanks to the use of the new apparatus, photometric and spectral observations are presently being conducted in a wide range, permitting the measurement of the intensity of three basic emissions of the night sky (λ 5,599 OI, λ 6,300 OI, λ 5,893 NAI), the total intensity of the band related to the illumination of atmospheric hydroxil, and also to observe the appearance in spectra of the night sky of lines belonging to spectra of low-latitude aurorae which originate during strong magnetic perturbations, especially during a period of solar activity.

The systematic study of outbreaks of twilight sky emissions in a wide region of the spectrum, the determination of the altitude and temperature of the radiating layers, the construction and investigation of isophots for variations in the illumination of the night sky, the investigation of the connection of parameters of the twilight and the night sky with variations of the electron density in the ionosphere and of the ultraviolet and corpuscular radiation of the Sun are natural continuations of this work.

Recently the investigation of the upper atmosphere at the Abastumani Observatory was broadened by measurements of the ozone content and its variations with space and time. The new three-channel photoelectric ozonograph is being used for this purpose for day (according to the Sun) and

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night (according to the Moon) observations. ("Lunar and Planetary Investigations at Abastumani," by Ye. K. Kharadze, V. P. Dzhapiashvili, and T. G. Megrelishvili; Moscow, Vestnik Akademii Nauk SSSR, No 11, Nov 58, pp 42-45)

Boundary of Earth's Atmosphere Found to be Higher by Soviets

A study of the signals of Soviet artificial earth satellites makes it possible to conclude that the altitude of the boundary of the Earth's atmosphere, that is the region where it intermingles with interplanetary gas, is approximately 2,000 to 3,000 kilometers. ("Figures and Facts"; Moscow, Nauka i Zhizn', No 11, Nov 58, p 60)

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III. METEOROLOGY

Functions of Distribution of Cloud Droplets According to Sizes

An analysis of the materials of the El'brus Expedition of the Institute of Applied Geophysics, Academy of Sciences USSR, shows that functions of the distribution of droplets according to size in clouds and artificial fogs coincide very well with gamma-distribution having an index of 6-8, where the index of the distribution usually exceeds a value of 2. The same gamma-distribution will be also observed in aerosols for which there is a logarithmically normal distribution of particles according to size.

A method for checking the correspondence of the experimental distribution to gamma-distribution and a method for determining its basic characteristics are proposed.

A formula connecting the optical density of a cloud with long waves of radiation and the mean square diameter of the cloud particles is derived. A qualitative analysis of the influence of the parameters of the distribution of cloud particles on the weakening of the visible radiation in clouds is made. ("Functions of the Distribution of Cloud Droplets According to Size. Optical Density of a Cloud," by L. M. Levin, Institute of Applied Geophysics, El'brus Expedition, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Geofizidheskaya, No 10, Oct 58, pp 1211-1221)

IV. OCEANOGRAPHY

Soviet Submarine Laboratory Completes First Test Voyage

The newly converted Soviet submarine, which is to be used by the All Union Scientific Research Institute of the Fish Economy and Oceanography (VNIRO) as a scientific laboratory, made its first test voyage in the Barents Sea from 14 to 24 December.

The ship, while yet officially unnamed, is affectionately called the "Severyanka" by the crew and scientists aboard her.

The Severyanka will leave on its first long voyage to Soviet fishing grounds on 29 December. ("'Severyanka' Goes to Sea"; Moscow, Izvestiya, 24 Dec 58, p 12)

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The Severyanka is equipped with the newest instruments which will permit it to penetrate the depths of the sea and to solve many riddles of the world oceans. The main problem which expeditions on the Severyanka must solve is of great practical value to the Soviet fishing industry. This is the study of the behavior of fish and the medium in which they live.

A description of the type of operations which will be conducted by this unique ship was given in a Pravda article by its special correspondent Timur Gaydar, who was on board during the test voyage.

The ship was sent into its first dive by Valentin Petrovich Shapovalov. Powerful searchlights were turned on as it submerged. V. G. Azhazha head of the submarine laboratory explained some of the special features of the ship. All the surrounding waters, above, below, and around the ship are monitored by hydroacoustical instruments. Three portholes in the forward part, one on either side and one overhead, can be used for observations. Vision directly forward is provided by a televisor. A number of instruments are used to study the water medium. With their aid it is possible to instantly and precisely measure the salinity, temperature, and percentage of oxygen in the water, and its radioactivity. Soil samples can be taken of bottom depositions.

Observations were made by Dmitriy Viktorovich Radakov, ichthyologist, and David Efimovich Gershanovich, marine geologist.

In a demonstration of the techniques which will be used in observing trawling operations, Anatoliy Vasil'yev, acoustics technician, directed the submarine by means of his instruments to a trawl drawn by a fishing boat in the vicinity. Until it was spotted in the powerful beams of the searchlights by Ksenofont Leonidovich Pavlov, engineer-lookout. The operation of the trawl was observed for several minutes before the submarine continued on its way. A picture of the ship accompanies the article. ("Expedition in the Depths of the Sea," by Timur Gaydar, Special Pravda Correspondent; Moscow, Pravda, 24 Dec 58, p 4)

Fourth Expeditionary Voyage of Lomonosov Completed

Expeditionary operations by the ship Mikhail Lomonosov of the Marine Hydrophysics Institute, Academy of Sciences USSR, conducted according to the IGY program, on its fourth voyage have been successfully completed. The investigations made it possible to make very important conclusions on the seasonal fluctuations of oceanological characteristics of the northern part of the Atlantic from Cape Finisterre (Spain) to the shores of Newfoundland.

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Despite the difficult weather of the autumn-winter season, operations were persistently conducted by the crew and the scientific complement on board. Even in the region where the warm waters of the Gulf Stream encounter the cold Labrador Current, work was not interrupted despite winds reaching an intensity of 10-11 balls.

The ship's last stop was Liverpool, where its stores were replenished and its boilers cleaned. During its stay, 11-17 December, shore visits were made by the crew and scientific personnel. English scientists and students visiting the ship were acquainted with the results of the work of the expedition by G. P. Ponomarenko, Candidate of Physicomathematical Sciences, chief of the expedition, and A. V. Il'yin, geologist, Candidate of Geographical Sciences.

The Mikhail Lomonosov is expected in Riga on 25 December after a stop at Warnemunde to put ashore a group of German scientists who participated in the work of the expedition. ("Toward Native Shores," by K. Bannov, first mate on board the Mikhail Lomonosov; by radio, Moscow, Izvestiya, 20 Dec 58, p 4

Vityaz' in San Francisco

The Vityaz', expeditionary ship of the Institute of Oceanology, Academy of Sciences USSR, arrived in San Francisco on 17 December 1958.

Over 5,000 persons visited the ship in one day, 19 December. Among these were 300 local scientists. Eight reports were read by Vityaz' scientists to American oceanographers. ("Vityaz' in San Francisco," by N. Sysoyev, Chief of Vityaz' expedition; Moscow, Pravda, 22 Dec 58, p 4)

V. SEISMOLOGY

Soviet Studies Confirm Liquid State of Earth Nucleus

Ye. P. Fedorov, Soviet scientist, has established that the center of the Earth is a nucleus 7,000 kilometers in diameter possessing the properties of a liquid, on the basis of many years of investigations during which about 200,000 observations on the movement of the Earth's geographic pole were analyzed. This is in full agreement with seismic data. ("Figures and Facts"; Moscow, Nauka i Zhizn', No 11, Nov 58, p 60)

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VI. ARCTIC AND ANTARCTIC

New Soviet Antarctic Station Established

The sled-tractor train headed by Engineer G. Burkhanov, which left Komsomol'skaya at the end of October, successfully reached the station Vostok, where it delivered equipment, and is now on the way back to Mirnyy.

The other part of the train, consisting of five heavy caterpillar tractors, towing loaded sledges, continued its course to the pole of relative inaccessibility. The train included a group of scientists. At each stop they conducted meteorological, magnetic, gravimetric, seismological, glaciological, and other observations. On 29 November, the train reached the station Sovetskaya. Here the motor vehicles and sledges were again inspected, and on 3 December four tractors continued on their way. The train consisted of 18 polar scientists, headed by Ye. Tolstikov, chief of the expedition.

Moving to the southwest of Sovetskaya, the tractors advanced with great difficulty. The vehicles sank deeply into the loose snow. The air temperature was minus 30-40 degrees Centigrade. The train traveled at an elevation of 3,500-4,000 meters above sea level.

On 14 December, at 1445 hours Moscow time, the train reached the pole of relative inaccessibility. The route from the Pravda Coast covered 2,200 kilometers into the interior of the continent.

The new scientific station "Pole of Inaccessibility" was organized at a point with coordinates 82-06 S and 55-00 E, at an elevation of 3,710 meters. This station is intended for "episodic" scientific research and will represent a base for future interior expeditions of Soviet polar scientists. The USSR state flag was raised at the station site. Next to it, a bust of Lenin was erected on a hill.

Soviet scientists have begun various types of research work at the pole of relative inaccessibility. The first reports with scientific data have been transmitted to Mirnyy. The members of the expedition are preparing a landing strip for planes arriving from Mirnyy. -- V. Nikolayev, Candidate of Technical Sciences, chief of overland transport detachment.

The radio station at the new south polar station has begun to operate. Its call signs are "RSON." The station is transmitting weather data on one of the most interesting regions of the earth. On 16 December, the air temperature in this region was minus 30 degrees Centigrade.

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The station building is erected on huge all-metal sledges. The scientific staff consists of four persons headed by the chief of station Sovetskaya, the experienced antarctic explorer V. Babarykin. The staff was provided with a supply of food and fuel for about 3 months. All members of the expedition are in good health. ("One More Pole is Conquered;" Moscow, Vodnyy Transport, 16 Dec 58)

Activities in Antarctic

The work of the Third Antarctic Expedition is coming to an end. A new staff of polar workers will soon arrive on the Ob'.

In connection with the completion of research under the IGY program, the number of scientific stations operating on a 24-hour basis will be somewhat reduced in 1959. The observatory at Mirnyy and the station Vostok will conduct research and observations under an extensive program. A new station, Lazarev, will be established on the coast in the region of the 20th degree E longitude. The station Oazis will be placed at the disposal of Polish scientists. Komsomol'skaya will operate temporarily during the summer period.

The personnel and equipment of the stations Sovetskaya and Pionerskaya will be taken out, and the stations themselves will be deactivated. At the same time, a new station for temporary scientific observations will be equipped, which will also serve as a base for interior sled-tractor expeditions. This station-base will be located at the pole of relative inaccessibility.

A preliminary brief study of the seismograms taken by the interior expedition showed that there is a deep subglacial depression south of the station Pionerskaya. Farther on, as far as Komsomol'skaya, the bottom of the glacier is close to sea level. Between Komsomol'skaya and Sovetskaya, and farther in the direction of the pole of relative inaccessibility, the mountain relief is very complex. The maximum thickness of the ice, measured on this route, is 3,770 meters.

The work of the overland expeditions is supported by airplanes on 8 December, an IL-12 plane returned to Mirnyy from a flight to contact the interior expedition. The plane flew over a region which had not been seen previously from the air. Individual peaks of mountain ranges and ice cupolas could be distinguished, which were not indicated on any maps. The last few days of the expedition have produced some interesting results. -- Ye. Tolstikov, chief of Soviet Antarctic Expedition. ("Expedition into the Interior of Antarctica;" Moscow, Pravda, 15 Dec 58)

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Rescue of Belgian Plane Crew in Antarctic

On 11 December 1958, the Soviet antarctic station Mirnyy received an SOS signal from a Belgian airplane which crashed about 200 kilometers from Princess Ragnhild Coast. Gaston de Gerlache, chief of the Belgian antarctic base "Roi Baudouin," appealed to the Soviet station staff for help. A rescue expedition was instructed to fly to the area of the accident under the command of the Soviet polar pilot Perov. A heavy storm, which arose in East Antarctica on 11 December, prevented the plane from taking off the same day.

The plane from Mirnyy was to fly a distance of over 3,000 kilometers, via the Australian stations Davis and Mawson, and the Japanese base Showa, which had been abandoned by the Japanese explorers early in 1958 because of difficult ice conditions. ("A Distress Signal;" Moscow, Izvestiya, 12 Dec 58)

The Belgian expedition airplane which crashed in the region of the Crystal Mountains, 200 kilometers from the coast, had four men on board. A rescue attempt was made by the Belgian expedition base "Roi Baudouin," located about 250 kilometers from the place of the accident. However, the overland rescue detachment was unable to penetrate into the interior because of impassable ice crevasses. One motor vehicle and two sledges were lost in the attempt.

The LI-2 ski plane piloted by Perov took off from Mirnyy on 12 December at 1400 hours Moscow time. The plane made a landing at the Australian station Mawson for refueling. ("To the Aid of the Belgian Antarctic Explorers;" Moscow, Pravda, 13 Dec 58)

On the flight from the Australian station Mawson, the LI-2 plane landed at the station Showa of the Japanese antarctic expedition. A supply of gasoline was left here for use on the return flight.

The Belgian base "Roi Baudouin" was reached on 13 December. The Soviet plane immediately undertook the first 1 1/2-hour flight to the place of the accident. The search was made more difficult by the fact that no radio contact existed with the crew of the crashed plane. ("Soviet Pilots Arrive in Area of Belgian Plane Crash;" Moscow, Pravda, 14 Dec 58)

Weather conditions in the area of the Belgian station "Roi Baudouin" on 13 December did not permit a continuation of the search for the crashed Belgian airplane on the same day. The Soviet plane took off again on 14 December, at 1225 hours Moscow time. At 1440 hours, the wreck of the Belgian plane was discovered near the Crystal Mountains, at which spot a landing was made. According to a note found in the Belgian plane, the crew members had left to go to the supply depot, located at 71-51 S and 27-30 E. The distance from the plane wreck to the depot was 130 kilometers. The region between the Crystal Mountains and the depot abounds in crevasses. Pilot Perov continued his search for the Belgian party. ("Belgian Plane Is Found;" Moscow, Pravda, 15 Dec 58)

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During the afternoon of 14 December, Perov's plane flew out twice from the station "Roi Baudouin" to search for the Belgian party. The LI-2 searched the area through which it was assumed the party had gone in the direction of the food supply base. During one of the flights on 14 December, the Soviet pilots discovered, at a distance of 2 kilometers from the spot where the wrecked plane had been abandoned, a tent with some personal belongings and scientific instruments of the Belgians. On 15 December it was decided to make a landing at this spot in an attempt to find clues regarding the whereabouts of the crew of the abandoned plane. At 1600 hours Moscow time the LI-2 landed near the tent. No people were found in the vicinity, nor was any note found in the tent. After half an hour, the Soviet plane took off again and continued its search, flying at a low altitude. None of the four missing men were seen on the way to the supply base. ("In the Region of the Crystal Mountains;" Moscow, Pravda, 16 Dec 58)

Finally, on 16 December, at 0147 hours Moscow time, Perov's plane crew discovered one more tent, and some men next to it. The Soviet plane landed at this spot and took the men aboard, returning with them to the station "Roi Baudouin." ("Belgian Pilots Are Found;" Moscow, Izvestiya, 16 Dec 58)

At 0332 hours on 16 December, the Soviet plane with the rescued four Belgians aboard landed at the station "Roi Baudouin." All four of them were in good condition.

The Soviet crew aboard the LI-2 rescue plane consisted of V. M. Perov, commander of the plane; V. V. Afonin, co-pilot; B. S. Brodkin, navigator; V. N. Sergeyev and Ye. N. Men'shikov, plane mechanics; N. G. Zorin, radio operator; and V. M. Makushok, interpreter.

On 16 December, the Belgian Ambassador to the USSR called on A. V. Zakharov, Deputy Minister of Foreign Affairs USSR, and expressed thanks on behalf of the Belgian government for the rescue by the Soviet pilots of the four crew members of the Belgian plane which had crashed in Antarctica. ("The Noble Deed of Soviet Pilots"; Moscow, Pravda, 17 Dec 58)

Ob' Reaches Capetown

The Soviet diesel-electric ship Ob', enroute to Mirnyy, Antarctica, left Capetown, South Africa, on 18 December after taking on fuel and water. ("From Everywhere About Everything"; Moscow, Izvestiya, 20 Dec 58, p 4)

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